

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

REMARKS

Reconsideration of the subject application, as amended, is respectfully requested.

The claims of the subject application are directed to gemstone fluorescence measuring in which the intensity of the fluorescence reaction of a gemstone radiated by ultraviolet light is measured. For example, independent claim 1 recites an ultraviolet radiation source which provides both trans-radiation and direct radiation to the gemstone under test, and a light detector configured to detect visible light emitted from the gemstone in reaction to the applied UV radiation. As another example, new independent claim 20 recites an ultraviolet radiation source which provides radiation to the gemstone under test, and a light detector positioned and configured to measure directly the intensity of visible light emitted from the gemstone in reaction to the applied UV radiation. Independent claim 10 is directed to a radiation subsystem for use in a gemstone fluorescence measuring device, and recites upper and lower UV radiation sources that emit UV radiation along an emission axis, and a mounting surface located between the upper and lower UV radiation sources that is configured to accommodate a gemstone under test.

Claims 1-31 are pending in the subject application. Claims 20-31 are newly added by the subject amendment. Support for new claims 1 and 28 can be found, for example, in paragraph 35 of the subject application. New claims 21-26 recite features similar to those recited in originally filed claims 2-4 and 7-9. Support for new claim 27 can be found in paragraph 35 of the subject application, for example. New claim 29 finds support in paragraph 42, new claim 30 finds support in paragraph 35, and new claim 31 finds support in paragraph 37.

Claims 1, 10, 16, 20 and 28 are independent claims.

The has Examiner objected to claims 3-6, 12-14, 18 and 19 as being dependent upon a rejected base claim, and indicated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

claims. Applicant gratefully acknowledges the Examiner's indication of allowable subject matter.

The Examiner's Rejections:

Claims 1-2, 10-11, 16-17 -- U.S.C 102(b) – Aggarwal:

The Examiner has rejected claims 1-2, 10-11, and 16-17 under U.S.C 102(b) as being anticipated by Aggarwal (6,239,867). Applicant respectfully traverses this rejection.

Applicant respectfully submits that Aggarwal fails to teach, suggest or make obvious the subject matter recited in claims 1-2, 10-11, and 16-17. For example, as to claim 1, Aggarwal fails to teach, suggest or make obvious an ultraviolet radiation source that applies both trans-radiation and direct radiation to the gemstone under test. Further Aggarwal fails to teach, suggest or make obvious a light detector that is configured to detect visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test.

As understood by Applicant, Aggarwal teaches, at col. 12, lines 28-67, and particularly at col. 12, lines 57-63, the use of a fluorescent light 64 and a light 90 in obtaining a fluorescence image A17. While light 64 is described at col. 9, lines 2-6, as an "ultra violet light," light 90 is described at col. 10, line 60 to col. 11, line 3, as "a D 55 ring light having a color rendition and an ultra violet component that closely resembles North-Daylight at 5500°K." Thus, the "North-Daylight" characteristic of light 90, which clearly is a visible light source, means that the combination of light 64 and light 90 (used in obtaining image A17) cannot be considered an ultraviolet radiation source that provides trans-radiation and direct radiation to the gemstone under test.

In particular, at col. 12, lines 28-68, of Aggarwal, the conditions are specified under which a series of images, A1-A18, are taken. For the profile and color images A1-A16, light 102 is variously enabled or disabled; however, light 90 is enabled for all images A1-A16. (As noted above, light 90 resembles North-Daylight at 5500° K – in other words, visible light with a small amount of invisible ultra violet included. Light 102 is described at col. 10, lines 52-56, as a diffused light source.)

SF3115619.1
333397-165920

-8-

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

Then, for image A17, Aggarwal states at col. 12, lines 57-63, "[u]pon completion of the profile and color imaging [A1-A16], light 102 is disabled and fluorescent light 64 is enabled to obtain a fluorescence image A17 which is used together with the last captured color and profiled image of set (A1-A16) to check for fluorescence levels" (Light 64 is described at col. 9, lines 2-6, as an ultra violet light.) Only light 102 is indicated as disabled, and nowhere is it indicated that light 90 is disabled for the taking of image A17. In contrast, in the next section at col. 12, lines 65 et seq., describing the conditions for image A18, it is stated that "[i]mage (A18) is captured by disabling all lights, and enabling front light 77" Thus, Aggarwal teaches that fluorescence image A17 is taken with both light 90 (North-Daylight) and light 64 (ultra violet) enabled. Aggarwal therefore does not teach, suggest or make obvious, an ultraviolet radiation source that provides trans-radiation and direct radiation to the gemstone under test.

As to the light detector element of claim 1, Aggarwal does not teach, suggest or make obvious a light detector that is configured to detect visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test. In Aggarwal, the fluorescence image A17 (taken with visible and ultra violet light) "is used together with the last captured color and profile image of set (A1-A16) [taken with light 90 as a light source] to check for fluorescence levels" (Col. 12, lines 57-64.) The passage at col. 15, lines 37-42, explains how image A17 is used: "average R.G.B. values are additionally obtained from the gemstone color image under ultra violet radiation via step 248, image (A17). The difference between the average R.G.B. value without ultra violet radiation [light 90] and under ultra violet radiation [light 90 and light 64] are used to determine the presence of fluorescence in step 250." This is clearly different from a light detector that is configured to detect visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test, as is recited in claim 1. It is respectfully submitted that in Aggarwal, both image A17 and the "difference between the average R.G.B. value without ultra violet radiation and under ultraviolet radiation" rely upon visible light from North-Daylight source 90, and therefore cannot be said to represent "visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test."

BEST AVAILABLE COPY

SF3115619.1
353397-165920

-9-

Appln. No. 10/756,164
 Amendment dated September 26, 2005
 Reply to Office Action mailed June 16, 2005

Similarly, independent claim 10 is allowable over Aggarwal. For example, Aggarwal does not teach, suggest, or make obvious, upper and lower ultraviolet radiation sources. Aggarwal's light source 90, which is enabled when fluorescence image A17 is taken, and when profile and color images A1-A16 are taken, is a source that "closely resembles North-Daylight at 5500° K," and therefore cannot be said to be an "ultraviolet radiation source." (Col. 10, lines 62-64.)

Independent claim 16 is patentable over Aggarwal for reasons similar to those for claim 1. Specifically, claim 16 recites "radiating a gemstone under test with ultraviolet ("UV") radiation from both above and below the gemstone under test. As described above, Aggarwal teaches the combination of an ultra violet source (light 64) and a visible light source (light 90 – North-Daylight at 5500° K with a small amount of invisible ultra violet included). It is respectfully submitted that Aggarwal's combination of visible and ultra violet light is not "ultraviolet radiation" as recited in claim 16.

Further, as set forth above, Aggarwal's approach is to obtain average R.G.B. values in image A17 [using light 90 and light 64], and to take the difference between the average R.G.B. value without ultra violet radiation [using light 90] and under ultra violet radiation [using light 90 and light 64] to determine the presence of fluorescence. It is respectfully submitted that such an approach is clearly different from that recited in independent claim 16, which involves "detecting visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test, resulting in a detected visible light measurement," as recited in claim 16.

In the Official Action, the Examiner cited a number of passages from Aggarwal as disclosing certain elements of claims 1-2, 10-11, and 16-17. However, it is respectfully submitted that the cited passages do not disclose features identified by the Examiner, or that the specified claim does not recite the identified feature, as follows:

Office Action p.	Claim – element	Cited Aggarwal passage	Comments
3	1 – "an ultraviolet ('UV') radiation source configured to provide trans-radiation and direct radiation to the	col. 7, lines 50-54, see fig. 3	Cited passage refers to Fig. 2, and does not describe any light source, much less a UV

SF3115619.1
 353397-165920

-10-

BEST AVAILABLE COPY

Appln. No. 10/756,164
 Amendment dated September 26, 2005
 Reply to Office Action mailed June 16, 2005

Office Action p.	Claim – element	Cited Aggarwal passage	Comments
	gemstone under test"		light source.
3	1 – "a light detector positioned proximate the gemstone under test, said light detector being configured to detect visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test"	col. 5, lines 50-55, see fig. 3	Cited passage refers generally to gauging "the spectral response to a plurality of light sources," and does not describe detecting visible light emitted from the gemstone under test in reaction to UV radiation.
3	2 – "wherein said UV radiation source comprises a plurality of light emitting diodes ("LEDs")"	fig. 3	Although light source 74 is described in the preferred embodiment as an "LED light source" at col. 11, lines 17-25, there is no description of light source 74 being a UV radiation source, much less the LED light source (of the preferred embodiment of light source 74) being a UV radiation source.
3	10 – a light detector configured	col. 5, lines 50-55, see fig. 3	Claim 10 does not recite a "light detector."
4	11 – "wherein said upper UV radiation source and said lower UV radiation source are configured to provide trans-radiation and direct radiation to the gemstone under test"	col. 7, lines 50-54, see fig. 3	Cited passage refers to Fig. 2, and does not describe any light source, much less a UV light source.
4	16 – a light detector	col. 5, lines 50-55, see fig. 3	Claim 16 does not recite a "light detector."
4	16 – a processing axis	col. 10, lines 25-30, lines 60-66, see fig. 3	Claim 16 does not recite a "processing axis."
4	16 – a unitary stage	col. 9, lines 32-37, see fig. 3	Claim 16 does not recite a "unitary stage."
4	17 – "a UV radiation source that provides trans-radiation and direct radiation to the gemstone under test"	col. 7, lines 50-54, see fig. 3	Cited passage refers to Fig. 2, and does not describe any light source, much less a UV light source.

SF3115619.1
 353397-165920

-11-

BEST AVAILABLE COPY

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

For the foregoing reasons, it is respectfully submitted that independent claims 1, 10 and 16, and claims 2-9, 11-15 and claims 17-19, which are respectively dependent therefrom, are allowable over Aggarwal.

Claims 7, 8 and 15 – U.S.C 103(a) – Aggarwal/Yifrach, et al:

The Examiner has rejected claims 7,8 and 15 under U.S.C 103(a) as being unpatentable over Aggarwal in view of Yifrach, et al. (5,118,181). In particular, the Examiner has cited Yifrach et al. as “controlling the ultraviolet light source via a controller (52, fig. 3, col. 5, lines 9-12).” Applicant respectfully traverses this rejection.

First of all, for the reasons set forth above in connection with the allowability of independent claims 1 and 10 over Aggarwal, it is respectfully submitted that claims 7, 8 and 15, as dependent from allowable claims 1 and 10, respectively, are also allowable.

Further more, it is respectfully submitted that Aggarwal does not teach an LED ultra violet source of radiation. (See the discussion regarding claim 2 in the foregoing table.) Therefore, because an ultra violet LED source of radiation is lacking in Aggarwal, even if it were obvious to combine Aggarwal and Yifrach et al. such combination would not include an LED source of ultraviolet radiation as recited in claims 7, 8 and 15.

Also, it is respectfully submitted that Yifrach et al. is directed to an identification technique to separate gemstones from each other based on spectral response. See, Yifrach, et al., col. 5, lines 13-29. In contrast, Aggarwal is directed to measuring the change in color of a diamond by triggering a UV light source on and off in combination with visible light. See Aggarwal, col. 12, lines 28-64. These differences in what is being measured and how the measurements are used are respectfully submitted to teach away from rather than motivate one skilled in the art to combine the two references as asserted by the Examiner. In particular, because Aggarwal does not appear to involve the use of Image A17 for the identification of a gemstone, there would be no motivation to look to Yifrach et al. as asserted by the Examiner.

BEST AVAILABLE COPY

SF3115619.1
353397-165920

-12-

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

Claim 9 -- U.S.C 103(a) -- Aggarwal/Okazaki:

The Examiner has rejected claim 9 under U.S.C 103(a) as being unpatentable over Aggarwal in view of Okazaki (4,508,449). Specifically, the Examiner has asserted that Okazaki discloses a photo-detector to obtain a spectrum of the detected light, and an arithmetic unit for deriving the tristimulus values from the measured spectrum (col. 2, lines 15-31). Applicant respectfully traverses this rejection.

To begin, for the reasons set forth above in connection with the allowability of independent claim 1 over Aggarwal, it is respectfully submitted that claim 9, as dependent from allowable claim 1 is also allowable.

Further, neither Aggarwal nor Okazaki teach, suggest or make obvious "an ultraviolet ("UV") radiation source configured to provide trans-radiation and direct radiation to the gemstone under test". Okazaki teaches the use of "white light which has a wavelength in the range of from about 380 to about 780 nm or a monochromatic light which varies its wavelength in said range." (Col. 1, lines 43-46.)

Accordingly, claim 9 is allowable over Aggarwal in view of Okazaki.

New Claims 20-31:

It is respectfully submitted that none of the cited references teaches or suggests measuring directly the intensity of the fluorescence reaction of a gemstone radiated by ultraviolet light as set forth in new claims 20-31.

Aggarwal, USP 6,239,867, for instance is respectfully submitted to teach measuring the change in color by triggering a UV light source on and off in combination with visible light. Aggarwal teaches using a combination of visible and ultraviolet light, and therefore, does not teach, suggest or make obvious an ultraviolet ("UV") source configured to provide radiation to the gemstone under test, as recited in new independent claims 20 and 28. The result in Aggarwal is a measure of the impact of fluorescence level on the (visible) color of the diamond using a combination of visible and ultra violet light, and not a direct measure of the intensity of the fluorescence

BEST AVAILABLE COPY

SF3115619.1
353397-165920

-13-

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

reaction using ultra violet light, as recited in new claims 20 and 28. (See the detailed discussion above in connection with claims 1-2, 10-11, and 16-17.)

Further, Aggarwal at col. 8, lines 42-53, and at col. 15, lines 37-45, describes taking images via a CCD device in the form of pixel data sets, and how the difference between the average R.G.B. (red, green, and blue) values of the color image (A17) with and without ultra violet radiation are used to determine the presence of fluorescence in step 250 of Fig. 10C. It is therefore respectfully submitted that the Aggarwal procedure involves comparing an image taken with visible light (having a small amount of invisible ultra violet light) with an image taken with the same visible light and a substantial amount of invisible ultraviolet light added to it, and therefore does not involve "a light detector . . . configured to measure directly the intensity of visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test" as recited in new independent claim 20, or "measuring directly the intensity of visible light emitted from the gemstone under test in reaction to UV radiation applied to the gemstone under test, resulting in a detected visible light measurement," as recited in new claim 28.

Therefore, new independent claims 20 and 28 are allowable over Aggarwal, and new dependent claims 21-27 and 29-31, as dependent from allowable independent claims 20 and 28, are also allowable over Aggarwal.

New claims 27, 30 and 31 are further allowable over Aggarwal, because they recite a light meter as the light detector or the device used to measure the emitted visible light. It is respectfully submitted that Aggarwal does not teach, suggest or make obvious the use a light meter as recited in new claims 27, 30 and 31.

New claims 20-31 are also allowable over Yifrach and Okazaki for reasons similar to those set forth in foregoing discussion of claims 1-19.

In particular, Yifrach et al. is directed to an identification technique to separate gemstones from each other based on spectral response. See, Yifrach, et al., col. 5, lines 13-33. Thus, Yifrach et al. employs a plurality of detectors each having a different spectral response to measure pre-selected frequencies or wavelengths, in

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

order to identify and distinguish a gemstone from all other gemstones. In contrast, new independent claims 20 and 28 recite measuring directly the intensity of visible light emitted from the gemstone under test in reaction to UV radiation in reaction to UV radiation applied to the gemstone under test. This is clearly different from pre-selected frequencies or wavelengths being measured by Yifrach et al.

Okazaki teaches as measuring light the use of "white light which has a wavelength in the range of from about 380 to about 780 nm or a monochromatic light which varies its wavelength in said range." (Col. 1, lines 43-46.) Therefore, Okazaki does not teach, suggest, or make obvious, the use of ultraviolet light and measuring directly the intensity of the fluorescence reaction of a gemstone radiated by ultraviolet light as set forth in new claims 20-31.

For the foregoing reasons it is respectfully that new claims 20-31 are allowable over Aggarwal, Yifrach et al., and Okazaki alone or in combination.

Corrected Drawings:

As required by the Examiner corrected drawings are submitted under separate cover herewith. Specifically, reference number "14" in Fig. 1 has been changed to "146". Also submitted herewith are formalized drawings for all of the figures, including corrected Fig. 1, as indicated in red in the attached Exhibit A.

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SP3115619.1
353397-165920

-15-

Appln. No. 10/756,164
Amendment dated September 26, 2005
Reply to Office Action mailed June 16, 2005

Conclusion:

It is respectfully submitted, in view of the foregoing, that the subject application is in condition for allowance, and the Examiner's indication thereof is respectfully requested.

Respectfully submitted,
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